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# A Short History of Financial Ratio Analysis

*James O. Horrigan*

THE utility of accounting data seems to be assumed axiomatically by most accountants, but it is interesting to trace how accounting data have actually been used. In this article, the historical development of one particular usage, financial ratio analysis, will be followed from its early origins to the present time. Only the broad outline of this development will be presented;<sup>1</sup> and as seems appropriate, the discussions will be centered upon general analytical approaches or individuals. The presentation will follow the following chronological scheme: (1) Origins, (2) 1900-1919, (3) 1920-1929, (4) 1930-1939, (5) 1940-1945, and (6) 1946-to date. These demarcations in time are somewhat arbitrary, but they do encompass fairly well the important developments in ratio analysis. It must be borne in mind, however, that the discussion will relate mainly to the beginnings of developments within those periods. It is safe to say that virtually everything that has been started in ratio analysis is still going on today somewhere. Thus, a history of the development of ratio analysis is at the same time a fairly accurate description of its present practice.

## ORIGINS

The primary cause of the evolution of ratio analysis in general was Euclid's rigorous analysis of the properties of ratios in Book V of his *Elements* in about

300 B.C. However, the adoption of ratios as a tool of financial statement analysis is a relatively recent development.

The first causes of financial statement analysis can be traced back to the last stages of America's drive to industrial maturity in the last half of the Nineteenth Century. As the management of enterprises in the various industrial sectors transferred from the enterprising capitalists to the professional manager and as the financial sector became a more predominate force in the economy, the need for financial statements increased accordingly. Both of these changes were primary causes of financial statement analysis, but the shift in power to the financial institution was especially important.

Although there was much overlap, the development paths of ratio analysis for creditor purposes and for managerial purposes were different. Credit analysis emphasized measures of ability to pay

<sup>1</sup> For the reader interested in a more detailed history of ratio analysis, the early periods of development are covered in the following work: Sister Isadore Brown, "The Historical Development of the Use of Ratios in Financial Statement Analysis to 1933" (unpublished Ph.D. dissertation, School of Social Science, Catholic University of America, 1955). This is also available in a condensed, published version in Volume II of the "Catholic University of America: Studies in Economics."

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whereas managerial analysis emphasized profitability measures. Both of these paths were followed in the United States and their proponents freely borrowed from each other; but the credit analysis approach dominated the general development of ratio analysis, especially in the early years. Therefore, one must look primarily to credit analysis to gain an understanding of how ratio analysis evolved.

Concomitantly with the introduction of single-name paper loans, commercial banks began to request financial statements for lending purposes as early as the 1870's; but this did not become a widespread practice until the 1890's.<sup>2</sup> During the 1890's, the volume and flow of financial information increased greatly.<sup>3</sup> This flow of data was initially analyzed on a casual item-by-item basis; next a comparative columnar basis of analysis was developed; at about the same time, the segregation of current from non-current items was begun; and finally, the relationships between different items began to come under scrutiny.<sup>4</sup> Sometime in the last few years of the 1890's there arose the practice of comparing current assets of an enterprise to its current liabilities.<sup>5</sup> Other ratios were developed in the 1890's,<sup>6</sup> but this ratio, the current ratio, was to have a more significant and longlasting impact upon financial statement analysis than any other ratio. Truly, the usage of ratios in financial statement analysis can be said to have begun with the advent of the current ratio.

#### 1900-1919

After the turn of the century, some important developments in ratio analysis occurred during the period prior to and during World War I. Three of these developments were endogenous. First, a fairly large variety of ratios was conceived.<sup>7</sup> Second, absolute ratio criteria began to appear, the most famous being the 2 to 1

current ratio criterion.<sup>8</sup> Third, some analysts began to recognize the need for interfirm analysis and, consequently, the need for relative ratio criteria.<sup>9</sup> Despite these developments, few analysts actually used ratios during this period; and those who were inclined to use ratios tended to use only one, the current ratio.<sup>10</sup>

There were also two exogenous developments in this period which were very important. These were the passage of the first Federal income tax code in 1913 and the establishment of the Federal Reserve System in 1914. Both of these developments increased the demand for financial statements and led to improvements in their content.

The events in the ante World War I period provided the ferment for a study which became the "catalyst" of ratio analysis development. In 1912 Alexander Wall reacted to the apparent needs for more types of ratios and for relative ratio criteria by beginning a compilation of a large sample of financial statements from the files of commercial paper brokers. This analysis was culminated in his classic report of 1919, "Study of Credit Barometrics."<sup>11</sup> In this study, Wall compiled

<sup>2</sup> Roy A. Foulke, *Practical Financial Statement Analysis*, 5th edition (McGraw-Hill Book Company, 1961), pp. 13-19.

<sup>3</sup> *Ibid.*, pp. 19-25; and John N. Myer, *Financial Statement Analysis*, 3rd edition (Prentice-Hall Inc., 1961), pp. 6-7.

<sup>4</sup> Alexander Wall, *How to Evaluate Financial Statements* (Harper and Brothers, 1936), p. 68.

<sup>5</sup> Foulke, *op. cit.*, p. 178. His research on the usage of the current classification in the balance sheet indicates that 1891 was the earliest possible year the current ratio could have emerged; see p. 181.

<sup>6</sup> For a few examples, see Brown, *op. cit.*, pp. 61-62.

<sup>7</sup> For example, James Cannon, a pioneer of financial statement analysis, used ten different ratios as early as 1905 in a study of business borrowers.

<sup>8</sup> For an example of an early attempt to supply criteria for a variety of ratios, see William H. Lough, *Business Finance* (The Ronald Press Company, 1917), pp. 500-24.

<sup>9</sup> *Ibid.*

<sup>10</sup> Foulke, *op. cit.*, p. 178; and Wall, *op. cit.*

<sup>11</sup> Alexander Wall, *Study of Credit Barometrics*, Federal Reserve Bulletin (March, 1919), 229-43.

seven different ratios of 981 firms, for an unspecified time period. He stratified these firms by industry and by geographical location, with nine sub-divisions in each of those strata. Although he did not subject this data to any further analysis, he believed he found great ratio variation between geographical areas and between types of businesses. His results would be vulnerable to criticism by today's standards; but his study was historically significant because it was a widely-read, overt departure from the customary usage of a single ratio with an absolute criterion. Wall had, in effect, popularized the ideas of using many ratios and using empirically determined relative ratio criteria.

Another important development was taking place at approximately the same time as Wall's study, but in the area of managerial usage of ratios. In retail managerial analyses, the notion of using profit margins and turnovers, which are basically ratio concepts, was already well-developed.<sup>12</sup> However, a manufacturing concern began the most comprehensive usage of those types of ratios. In about 1919, the du Pont Company began to use a ratio "triangle" system in evaluations of its operating results.<sup>13</sup> The top of the triangle was a return on investment ratio (profits/total assets) and the base consisted of profit margin ratio (profits/sales) and a capital turnover ratio (sales/total assets). This system held promise for providing a framework wherein ratios could be developed in a logical fashion. The idea behind this development would appear occasionally in the literature; but in contrast to Wall's study, it went largely unnoticed until recent times.

#### 1920-1929

During the next decade, the 1920's, interest in ratios increased remarkably. A virtual explosion of publications on the subject of ratio analysis occurred.<sup>14</sup> At the same time, many compilations of industry

ratio data were begun by trade associations, universities, credit agencies, and individual analysts.<sup>15</sup> This process of collecting industry ratio data and computing averages therefrom was called "scientific ratio analysis,"<sup>16</sup> but the label "scientific" appears to have been a misnomer because there is no evidence that hypothesis formulation and testing were carried out.

These developments of ratio analysis in the early 1920's can be viewed largely as reactions to Wall's 1919 study. From that viewpoint, perhaps the real legacy of his study comes from the other notion he introduced: the usage of many types of ratios in analysis. A rapid, prolific development of different types of ratios took place during the 1920's;<sup>17</sup> and this proliferation has persisted up to the present time.

Wall, himself, attempted to mitigate the effects of ratio proliferation by developing a ratio index. This index was essentially a weighted average of different ratios with the weights being the relative value as-

<sup>12</sup> For example, see: Henry C. Magee, "Department Store Accounts," *The Journal of Accountancy* (April, 1915), 268-91. It is interesting to compare Magee's article, which contains an extensive discussion of ratio concepts, to a credit analysis article which contained only a few obtuse references to ratio concepts: J. Edward Masters, "Financial Statements as a Basis of Credit," *ibid.*, May, 1915, pp. 334-43.

<sup>13</sup> C. A. Kline, Jr., and Howard L. Hessler, "The du Pont Chart System for Appraising Operating Performance," *Readings in Cost Accounting, Budgeting, and Control*, ed. William E. Thomas, Jr. (South-Western Publishing Co., 1955), p. 752. The original ideas underlying such a system appear to have come from Alfred Marshall; see his *Elements of Economics of Industry* (Macmillan and Co., Ltd., 1892), pp. 310-11.

<sup>14</sup> Much of the literature of this time dealt directly with the acceptance or rejection of Wall's approach; Sister Isadore Brown made this observation in the condensed, published version of her study (*op. cit.*, p. 28; see n. 1).

<sup>15</sup> The earliest surviving compilers of annual ratio data appear to have been the following: (1) trade association: United Typothetae of America, 1922; (2) university: Harvard Business School, 1923; (3) credit agency: Robert Morris Associates, 1923.

<sup>16</sup> W. H. Justin, "Operating Control Through Scientific Analysis," *The Journal of Accountancy* (September, 1924), pp. 183-95.

<sup>17</sup> Lincoln may hold the record here; he discussed and illustrated forty different ratios. Edmond E. Lincoln, *Applied Business Finance*, 3rd revised edition (A. W. Shaw Company, 1925), pp. 339-58.

signed to each ratio by the analyst.<sup>18</sup> This effort was much derided,<sup>19</sup> but he appears to have been engaged in a praiseworthy attempt to develop a naive linear discriminate function.

Other analysts were also attempting to bring some sophistication to ratio analysis during the 1920's. Bliss presented the first coherent system of ratios which were tied in together in a logical *a priori* fashion. He considered ratios to be "indicators of the status of fundamental relationships within the business;"<sup>20</sup> and furthermore, he believed standard relationships would be set by competitive conditions. From these premises he developed a model of the firm which consisted entirely of ratios. He continuously interwove the relationships of ratios which measured cost and expense, turnover, and financial relationships to ratios which measured earnings. Bliss' model and the few hypotheses which he generated from it were naive, but his work represented a very promising beginning for the development of a theory of ratio analysis.<sup>21</sup>

The decade of the 1920's was a period of great enthusiasm for the possibilities of using ratios as tools of analysis, and it is perhaps fitting that the first real critic of ratios emerged during this same period. In 1925 Gilman listed the following objections to ratios: (1) their changes over time cannot be interpreted because the numerator and denominator both vary; (2) they are "artificial" measures; (3) they divert the analyst's attention from a comprehensive view of the firm; and (4) their reliability as indicators varies widely between ratios.<sup>22</sup> Considering the first three criticisms, Gilman clearly did not believe that ratios portray "fundamental relationships within the business;"<sup>23</sup> indeed, he appears to have been diametrically opposed to Bliss, and any other ratio enthusiasts.

One would expect that "schools" of ratio analysis would have developed

around these two opposite points—i.e., ratios are fundamental measures *vs.* ratios are artificial measures; but little happened. The contributions of Bliss and Gilman were acknowledged, but they were not expanded upon. Thus, the value of their contributions, for activating the development of a theory of ratio analysis, was largely lost.

### 1930-1939

In the next decade, the 1930's, the literary discussion of ratios and compilation of industry average ratios<sup>24</sup> continued unabated. The salient feature of this decade was the increased attention given to the empirical bases of ratio analysis.

A particularly important exogenous development was the formation of the Securities and Exchange Commission. This external influence, similar to those

<sup>18</sup> Alexander Wall and Raymond W. Duning, *Ratio Analysis of Financial Statements* (Harper and Brothers, 1928), pp. 152-79.

<sup>19</sup> One particularly caustic critic described Wall as the "... incurably optimistic theorist futilely and absurdly chasing the ratio absolute." Myron M. Strain, *Industrial Balance Sheets* (Harper and Brothers, 1929), pp. 169-70.

<sup>20</sup> James H. Bliss, *Financial and Operating Ratios in Management* (The Ronald Press Company, 1923), pp. 34-38.

<sup>21</sup> Bliss also attempted to demonstrate that normal ratio relationships could be determined by computing average industry ratios, but his attempt was unsuccessful; *ibid.*, pp. 225-387. Unfortunately, he is remembered mainly for that; see Myer, *op. cit.*, p. 12.

<sup>22</sup> Stephen Gilman, *Analyzing Financial Statements* (The Ronald Press Company, 1925), pp. 111-12. He also criticized the computation of industry average ratios, but he was really attacking the limitations of the underlying absolute accounting data, especially their lack of comparability and consistency. Statement analysts are still concerned about this problem, of course.

<sup>23</sup> Given the paucity of empirical studies at that time, it is not clear what basis Gilman could have used to develop his fourth criticism.

<sup>24</sup> This began to change somewhat in that attempts were made to stratify the ratio data beyond merely the firms' industry; e.g., George T. Bristol used such strata as product mix and credit policy in "Merchandising Problems of Grocery and Candy Wholesalers," *Dun's Review* (October, 1937), pp. 21-24, 46-47. Also, statistical information such as variances and graphic frequency distributions were sometimes being provided in addition to averages; e.g., A. H. Winakor, *Balance Sheet Structure of Automobile Manufacturing Companies* ("Studies in Financial Structure," Bulletin No. 29; Urbana, Ill.: Bureau of Business Research, The University of Illinois, 1930). However, neither of these changes proved to be generally enduring.

mentioned previously, also increased the supply of financial statements and influenced their content.<sup>25</sup>

There were two significant developments in this decade relating directly to ratio analysis. The first of these was embodied in a discussion in the literature pertaining to the determination of the most efficacious group of ratios. In this respect, the most successful promoter of his own particular group of ratios was, by far, Roy A. Foulke. He was successful largely because he could supply annual industry data for his group of ratios.<sup>26</sup> Foulke actually began to develop this group of ratios, which would eventually number fourteen, during the late 1920's while he was employed at the National Credit Office;<sup>27</sup> but they were not widely promulgated until the 1930's under the auspices of his next employer, Dun & Bradstreet. The publication of his ratios was begun in 1933,<sup>28</sup> and this collection of ratios quickly became the most influential and well-known industry average ratios series.

Foulke was a particularly important figure in the development of ratio analysis because his efforts brought to fruition the approach which became the essential "modus operandi" of ratio analysis in this country. In this approach, *a priori* analysis and/or empirical evidence were rarely provided to substantiate an author's claim that his particular selection of ratios represented an efficient collection of ratios for analyzing financial statements. Rather, the author's group of selected ratios—and sometimes accompanying absolute and relative criteria—were promulgated solely on the authority of his experience in statement analysis.<sup>29</sup> This approach, which might be called "pragmatical empiricism," probably sufficed for the needs of ratio analysis practitioners; but it left the subject of ratio analysis devoid of any well-developed, testable theory.

However, the second significant development in this decade can be viewed as a counter-balancing movement. In the early 1930's, studies were made of the efficiency of ratios as predictors of business financial difficulties. Winakor and Smith began this movement in their analysis of a sample of firms which had experienced financial difficulties during the period 1923-1931.<sup>30</sup> They analyzed the prior ten years' trends of the means of twenty-one ratios;<sup>31</sup> and they concluded that the ratio of net work-

<sup>25</sup> This was partially an endogenous development because the Commission began to publish ratio data itself. It sponsored a WPA project begun in 1936 in which a variety of ratio data of individual firms in various industries were compiled; see the "Industry Reports" of the *Survey of American Listed Corporations* (Securities and Exchange Commission). It has published aggregate ratio data since the 1940's with the Federal Trade Commission in their *Quarterly Financial Report for Manufacturing Corporations* (U. S. Government Printing Office).

<sup>26</sup> Cf., Eugene S. Benjamin, *Practical Credit Analysis*, revised 3rd edition (Eugene S. Benjamin, 1939). Benjamin argued very persuasively during the 1930's for the usage of his six primary and six secondary ratios in conjunction with industry average ratios. However, his groups of ratios were never compiled and published; and there is no evidence that any vestige of his ratio system survived to present times.

<sup>27</sup> Roy A. Foulke, *The Commercial Paper Market* (The Bankers Publishing Co., 1931), pp. 120-32.

<sup>28</sup> They were published in the following series of articles in the *Dun & Bradstreet Monthly Review*: "Three Important Balance Sheet Ratios," (August, 1933), pp. 7-11; "Three Important Inventory Ratios" (December 1933), pp. 6-11; "Three Important Sales Ratios" (May, 1934), pp. 6-11; "Three Important Net Profit Ratios" (November, 1934), pp. 2-7.

<sup>29</sup> Foulke justified his fourteen ratios and their accompanying criteria by citing his many years of experience with them; *Practical Financial*, . . . , pp. 176, 229, 275, 352-54, 386. He explicitly rejected elsewhere the notion of *a priori* theorizing in regard to ratios and argued that only empirically obtained knowledge—especially ratio criteria—is possible for ratios; Roy A. Foulke, "Financial Ratios Become of Age," *The Journal of Accountancy* (September, 1937), pp. 209-10.

<sup>30</sup> They initially analyzed a sample of twenty-nine firms: Raymond F. Smith and Arthur H. Winakor, *A Test Analysis of Unsuccessful Industrial Companies* (Bulletin No. 31; Urbana, Ill.: University of Illinois, Bureau of Business Research, 1930); and they later analyzed 183 firms in the following work: Raymond F. Smith and Arthur H. Winakor, *Changes in the Financial Structure of Unsuccessful Industrial Corporations* (Bulletin No. 51; Urbana, Ill.: University of Illinois, Bureau of Business Research, 1935).

<sup>31</sup> They actually used a modified mean ratio which was computed from the inner half of their data—i.e.,  $(Q_7 - Q_1) / \frac{1}{2}N$ .

ing capital to total assets was the most accurate and steady indicator of failure, with its decline beginning ten years before the occurrence of financial difficulty. However, their study suffered the shortcoming of lacking a contrasting control group of successful firms; this was a serious shortcoming because of the time period covered in the study.

Two other studies concerning the predictive power of ratios were also carried out in the early 1930's, and control groups were used in these. Fitzpatrick, using a case-by-case method of analysis, studied the prior three to five years' trends of thirteen types of ratios for twenty firms which had failed during the period 1920-1929.<sup>32</sup> Following this up with a comparative analysis of a matched sample of nineteen successful firms,<sup>33</sup> he concluded that all his ratios predicted failure to some degree but the net profit to net worth, net worth to debt, and net worth to fixed assets<sup>34</sup> ratios were generally the best indicators. Ramser and Foster analyzed eleven types of ratios of 173 firms with securities registered in the State of Illinois.<sup>35</sup> They found that firms which turned out to be less successful and those which failed tended to have ratios which were lower than the more successful firms. However, two turnover ratios, sales to net worth and sales to total assets, exhibited an opposite tendency. These studies also suffered some shortcomings. Fitzpatrick's sample was small and too selective, and many of the differences between the average ratios in Ramser and Foster's study were more apparent than real.

In general, the shortcomings of these three studies were outweighed by the essential importance of their contribution. They represented an extremely significant event in the development of ratio analysis because they were the first carefully developed attempts to utilize the scientific

method for determining the utility of ratios.

#### 1940-1945

In the early 1940's, the development of the empirical base of ratio analysis continued in both a direct and an indirect fashion. In a direct fashion, the ratio prediction studies described above were, in a sense, culminated in Merwin's study.<sup>36</sup> Merwin analyzed the prior six years' trends of a large, unspecified number of ratios of "continuing" and "discontinuing" firms. Comparing industry mean ratios of "discontinuing" firms against "estimated normal" ratios,<sup>37</sup> he concluded that three ratios were very sensitive predictors of discontinuance, up to as early as four to five years in some instances. These three ratios were the following: (1) net working capital to total assets;<sup>38</sup> (2) net worth to debt;<sup>39</sup> and (3) the current ratio. Merwin's study was the first really sophisticated analysis of ratio predictive power, and the findings of the study still appear to be credible. Thus, after approximately a half-century of existence, the

<sup>32</sup> Paul J. Fitzpatrick, *Symptoms of Industrial Failures* (Catholic University of America Press, 1931).

<sup>33</sup> Paul J. Fitzpatrick, *A Comparison of the Ratios of Successful Industrial Enterprises with Those of Failed Companies* (The Accountants Publishing Company, 1932).

<sup>34</sup> Cf. Smith and Winakor, *Changes in the Financial*. . . Although they did not emphasize this point, their data demonstrate that the net worth to fixed assets ratio was also one of their best indicators.

<sup>35</sup> J. R. Ramser and Louis O. Foster, *A Demonstration of Ratio Analysis* (Bulletin No. 40; Urbana, Ill.: University of Illinois, Bureau of Business Research, 1931). They computed the first and third quartiles, but their analysis centered mainly upon the median ratios at time of registration.

<sup>36</sup> Charles L. Merwin, *Financing Small Corporations: In Five Manufacturing Industries, 1926-36* (National Bureau of Economic Research, 1942).

<sup>37</sup> The "estimated normal" ratios are estimates of what the discontinuing firms' ratios would have been if they had maintained the same average ratios as the surviving firms. This procedure was necessary because each year of discontinuance represented an assortment of calendar years. *Ibid.*, pp. 134-139.

<sup>38</sup> Cf. Smith and Winakor, *Changes in the Financial*. . .

<sup>39</sup> Cf., Fitzpatrick, *A Comparison of the Ratios*. . .

usage of some ratios was vindicated formally.

An important type of indirect development of the empirical base of ratio analysis accelerated noticeably in the early 1940's. During this period, ratios were increasingly used as independent and descriptive variables in aggregate economic studies. The idea of using single ratios for these purposes was not new, especially the profits to investment ratio;<sup>40</sup> but the practice of using a number of ratios to describe a wide variety of the firms' characteristics came into fruition during this period.<sup>41</sup> Although their center of attention was not the ratios as such, these studies did provide abundant information about the behavior of ratios over time and the variation of ratios between different groupings of firms; and a few of these studies did touch upon some questions relating directly to the possible usefulness of ratios in the analysis of financial statements.

These direct and indirect empirical studies were an important phase in the evolution of ratio analysis because they supplied materials which could be used for the formulation of hypotheses, as a preliminary step in the development of a formal theory of ratio analysis. However, the studies were not translated into the field of ratio analysis.<sup>42</sup>

#### 1946-to date

Since the early 1940's, the development of ratio analysis in this country has continued along various paths. First, there was a flurry of excitement during the 1950's about the utility of a ratio breakdown of return on investment for purposes of managerial analysis.<sup>43</sup> The notion of breaking down return on investment into a profit margin and a capital turnover ratio was not a new idea,<sup>44</sup> but it had not received widespread attention before this period. This was a promising development because the possibility existed that the

return on investment measure could serve as an apex in the development of an integrated ratio analysis system containing a variety of ratios.<sup>45</sup> However, the development along these lines in this country has generally not gone beyond the two secondary ratios of profit margin and capital turnover;<sup>46</sup> indeed, there is still ambivalence concerning the usefulness of even those two ratios.<sup>47</sup>

<sup>40</sup> This ratio, in various forms, was used earlier in the Federal Trade Commission's industry studies in the 1920's (e.g., U. S., Federal Trade Commission, *Report of the Federal Trade Commission on the War-Time Profits and Costs of the Steel Industry* (Government Printing Office, 1925)) and in the extensive research in the 1930's on the relationship of profits to the size of firms (e.g., William Leonard Crum, *Corporate Size and Earning Power* (Harvard University Press, 1939)).

<sup>41</sup> For example, Charles L. Merwin, *Financial Characteristics of American Manufacturing Corporations* "Temporary National Economic Committee: Investigation of Concentration of Economic Power," No. 15; (Washington: U.S. Government Printing Office, 1940); and Walter A. Chudson, *The Pattern of Corporate Financial Structure: A Cross-Section of Manufacturing, Mining, Trade, and Construction, 1937* (National Bureau of Economic Research, 1945). The "Financial Research Program" of the National Bureau of Economic Research is a particularly rich source of materials on ratios.

<sup>42</sup> As far as I can determine, the direct studies, as well as the indirect, have not been incorporated into the general ratio analysis literature. For example, a search by me of more than thirty books dealing with ratio analysis revealed that only two sources considered the ratio which was the best predictor in these studies—i.e., net working capital to total assets. Nathaniel Jackendoff reported a similar finding in "A Study of Published Industry Financial and Operating Ratios" *Economics and Business Bulletin*, Temple University (March 1962), p. 13.

<sup>43</sup> "Bibliography on Return on Investment," *N.A.A. Bulletin*, XLI (June, 1960), p. 91.

<sup>44</sup> Bliss appears to have been the first writer to introduce this idea into the field of ratio analysis; *op cit.*, pp. 91-93.

<sup>45</sup> One author has developed a system wherein return on net worth, rather than the return on total capital, serves as the apex; Kenneth R. Rickey, "How Accountants Can Help Management Manage," *N.A.A. Bulletin*, (July, 1963), pp. 25-36.

<sup>46</sup> An isolated example of a development beyond those two ratios is one writer's incorporation of inventory turnover and accounts receivable turnover as subcategories of total asset turnover; George Moller, "Try Budgeting for Return on Capital Employed," *The Controller*, (March, 1958), pp. 107-12, 128-36. An extensive ratio model of return on investment has been developed by Bela Gold in his *Foundations of Productivity Analysis* (University of Pittsburgh Press, 1955), pp. 272-77; but he used mainly productivity ratios, which require physical output and productive capacity data, rather than financial ratios.

<sup>47</sup> *Experience with Return on Capital to Appraise Management Performance* ("Accounting Practice Report,"



Another important aspect of this period has been the increased emphasis given to the role of ratios in the operations of small businesses. The Small Business Administration, in particular, has generated much interest in the utility of ratios as a managerial tool. It has published or financed a number of studies relevant to ratio analysis. There have been "how-to-do-it" booklets,<sup>48</sup> an evaluation of the reliability of industry average ratios,<sup>49</sup> analyses of the actual usage of ratios by small businesses,<sup>50</sup> and studies in which ratios were used as variables for examining and describing the operations of small business.<sup>51</sup>

Ratios were also being used as variables for examining and describing economic activity, thus further widening the empirical base of ratio analysis. First, additional evaluations of the predictive power of ratios were made. Hickman found that the times-interest-earned ratio and the net profits to sales ratio were useful predictors of the default experience of corporate bond issues during 1900-43,<sup>52</sup> and Saulnier and others found suggestive evidence from RFC lending experience during 1934-51 that borrowing firms with poorer current ratios and net worth to debt ratios were more prone to loan defaults.<sup>53</sup> Second, ratios were being used as independent variables in a series of studies dealing with the quality of credit under various cyclical conditions.<sup>54</sup> Among other things, these studies have established that certain financial ratios<sup>55</sup>—combined with some other ex-ante measures—were inversely correlated to an index of trade credit difficulties,<sup>56</sup> that loan criticisms made by bank examiners were consistently related to financial ratios,<sup>57</sup> and that the ability to obtain credit is associated directly with some financial ratios.<sup>58</sup> This series of studies should prove to be a rich source of materials for formulating ratio analysis hypotheses.

A recent direct study of the predictive

power of ratios warrants separate attention here. Beaver has analyzed the ability of ratios to predict the failure of firms during 1954-64; and similar to Merwin, he has found that some ratios predict failure up to five years in advance.<sup>59</sup> Beaver's study differs from Merwin's in two important respects: his statistical techniques were more powerful and some of his ratios were computed from funds statement data. This study will undoubtedly become a landmark for future research in ratio analysis.

Another interesting development of this period was some empirical research begun

No. 14; National Association of Accountants, 1962), p. 4.

<sup>48</sup> Richard Sanzo, *Ratio Analysis for Small Business* ("Small Business Management Series," No. 20; 2nd edition; Small Business Administration, 1960).

<sup>49</sup> Jackendoff, *loc. cit.*

<sup>50</sup> Nathaniel Jackendoff, *The Use of Financial Ratios and Other Financial Techniques and Services by Small Business* (Temple University, Bureau of Economic and Business Research, 1961).

<sup>51</sup> For example, Joseph C. Schabacker, *Cash Planning in Small Manufacturing Companies* ("Small Business Research Series," No. 1; Small Business Administration, 1960), pp. 127-31, 226-56; and J. L. McKeever, *A Study of the Problems of Small Retailers in Wyoming* (University of Wyoming, Division of Business and Economic Research, 1960), pp. 23-30, 59-73.

<sup>52</sup> W. Braddock Hickman, *Corporate Bond Quality and Investor Experience* (Princeton University Press, 1958), pp. 390-421.

<sup>53</sup> Raymond J. Saulnier, Harold G. Halcrow, and Neil H. Jacoby, *Federal Lending and Loan Insurance* (Princeton University Press, 1958), pp. 456-81.

<sup>54</sup> Geoffrey H. Moore, "The Quality of Credit in Booms and Depressions," *Financial Research and Problems of the Day*, Thirty-Seventh Annual Report (National Bureau of Economic Research, 1957), p. 44.

<sup>55</sup> Three ratios used in all these studies were the current ratio, the net working capital to total assets ratio, and the net worth to debt ratio.

<sup>56</sup> Martin H. Seiden, "Trade Credit: A Quantitative and Qualitative Analysis," *Tested Knowledge of Business Cycles*, Forty-Second Annual Report (National Bureau of Economic Research, 1962), pp. 86-88.

<sup>57</sup> Albert M. Wojinlower, *The Quality of Bank Loans: A Study of Bank Examination Records* ("Occasional Paper," No. 82; National Bureau of Economic Research, 1962), pp. 9-12.

<sup>58</sup> Geoffrey H. Moore and Thomas R. Atkinson, "Risks and Returns in Small-Business Financing," *Towards a Firmer Basis of Economic Policy*, Forty-First Annual Report (National Bureau of Economic Research, 1961), pp. 66-67.

<sup>59</sup> William H. Beaver, "Financial Ratios as Predictors of Failure," *Empirical Research in Accounting: Selected Studies, 1966* (University of Chicago, 1967), pp. 71-111.

on the predictive power of ratios in regard to psychological characteristics of firms. Sorter and Becker have examined the relationships of financial ratios to a psychological model of "Corporate Personality" and have found that conservative corporations maintain higher liquidity and solvency ratios.<sup>60</sup> This research should also prove to be an extremely valuable addition to the empirical base of ratio analysis.

One more important empirical development of this period was the beginning of a more rigorous scrutiny of the nature of financial ratios as such. First, the effects on ratios of different accounting procedures were examined. For example, Holdren found that LIFO inventory valuation, as opposed to FIFO valuation, changed the inventory turnover ratios of a sample of firms significantly but did not change some other ratios;<sup>61</sup> and Nelson found that capitalizing leases changed a large number of ratios.<sup>62</sup> Second, the behavior of a variety of ratios purporting to measure the same thing, the "defensive position of the firm," was examined and quite different patterns were found.<sup>63</sup>

Finally, the post-war surge of interest in the funds statement has been accompanied by the emergence of a new type of ratio, the funds statement ratio—i.e., a ratio in which funds statement items are used as its components. Walter laid the foundation for this development very carefully,<sup>64</sup> and suggestions of specific ratios followed quickly.<sup>65</sup> This development, which is still in a relatively embryonic stage, has been characterized by careful and well-constructed a priori analyses in contrast to the senseless proliferation of ratios which characterized the early development of ratio analysis.<sup>66</sup>

The period since the early 1940's is also significant because interest in ratio analysis began to increase noticeably in other countries.<sup>67</sup> In Australia, ratios—especially the current ratio—have been subjected to rigorous scrutiny in order to determine

their logicality and utility;<sup>68</sup> and they have been used as the basic ingredients of an application of the scientific method to financial management.<sup>69</sup> There is evidence that ratios similar to those used in this country are used in Australia, but the

<sup>60</sup> George Sorter and Selwyn Becker, "Accounting and Financial Decisions and 'Corporate Personality'—Some Preliminary Findings," *Journal of Accounting Research*, (Autumn, 1964), pp. 183-96. Also, George H. Sorter, Selwyn W. Becker, T. Ross Archibald, and William H. Beaver, "Accounting and Financial Measures as Indicators of Corporate Personality—Some Empirical Findings," in Robert K. Jaedicke *et al.*, (eds.) *Research in Accounting Measurement* (American Accounting Association, 1960), pp. 200-10.

<sup>61</sup> George C. Holdren, "Lifo and Ratio Analysis," *THE ACCOUNTING REVIEW*, (January, 1964), pp. 70-85.

<sup>62</sup> A. Tom Nelson, "Capitalizing Leases; The Effect on Financial Ratios," *The Journal of Accountancy*, (July, 1963), pp. 49-58.

<sup>63</sup> Sidney Davidson, George H. Sorter, and Hemu Kalle, "Measuring the Defensive Position of a Firm," *Financial Analysts Journal*, (January-February, 1964), pp. 23-29.

<sup>64</sup> James E. Walter, "Determination of Technical Solvency," *The Journal of Business*, (January, 1957), pp. 30-43. A few earlier usages of what were essentially individual funds statement ratios can be found (e.g., Bion B. Howard and Miller Upton, *Introduction to Business Finance* (McGraw-Hill Book Company, Inc., 1953)), pp. 135-38, but Walter was the first to specifically incorporate the funds statement into ratio analysis.

<sup>65</sup> Harold Bierman, Jr., "Measuring Financial Liquidity," *THE ACCOUNTING REVIEW*, (October, 1960), pp. 628-32; G. H. Sorter and George Benston, "Appraising the Defensive Position of a Firm: The Interval Measure," *ibid.*, pp. 633-40; and George Staubus, *A Theory of Accounting to Investors* (University of California Press, 1961), pp. 140-45.

<sup>66</sup> The general proliferation of ratios has certainly not ceased entirely; a contemporary writer, Tucker, recommended fifty-six ratios which could be computed from generally available financial statement data and, including other types of data, recommended a total of 429 ratios! Spencer A. Tucker, *Successful Managerial Control by Ratio-Analysis* (McGraw-Hill Book Company, 1961).

<sup>67</sup> Two authors of current general works on this subject describe ratio analysis as a very recent development in two countries given the most attention here, Australia and England. Alexander Fitzgerald, *Analysis and Interpretation of Financial and Operating Statements*, 2nd edition (Butterworths & Company, Ltd., 1956), pp. 60-61; and Bradbury B. Parkinson, *Accountancy Ratios in Theory and Practice* (Gee and Company Limited, 1951), pp. 5, 12-13.

<sup>68</sup> F. K. Wright, "An Examination of the Working Capital Ratio," *The Australian Accountant*, (March, 1956), 101-07; V. L. Gole, "The Management of Working Capital," *The Australian Accountant*, (June, 1959), pp. 319-29.

<sup>69</sup> R. J. Chambers, "Business Finance and the Analysis of Financial Statements," *The Australian Accountant* (August, 1948), pp. 253-65.

listings are not as proliferated.<sup>70</sup> There is also evidence that some authors were anxious to obtain industry average ratios,<sup>71</sup> hinting that Australia lacks a developed empirical base for ratio analysis. In general, a "common thread" or a school of thought on ratio analysis does not appear to have emerged yet in the Australian literature.

In England, on the other hand, a very distinct "common thread" in ratio analysis has developed. The British Institute of Management has generated interest in ratios as devices for making inter-firm comparisons in order to help management to appraise its efficiency and to make policy decisions for the future.<sup>72</sup> It has adopted the essential premise that return on investment is the primary ratio to which all other ratios would be related—i.e., ratio analysis should be a process whereby changes or differences in return on investment are analyzed.<sup>73</sup> This premise has provided an implicit framework within which elaborate listings of ratios have been developed.<sup>74</sup>

An interesting outcome of this activity in England was the installation of the Centre for Interfirm Comparison, which provides industry ratio data to British management. The Centre collects a pool of confidential data from participating firms and publishes these data as a "pyramid" ratio system. Return on investment—i.e., net operating profits to total assets employed—sits at the top of this series and various profit and expense margins descend on one side and various asset and equity turnovers on the other side.<sup>75</sup> This British system is a logical outgrowth of the framework developed by Bliss and applied so long ago by the du Pont Company, and ironically it is now receiving attention in the United States.<sup>76</sup>

In general, ratio analysis in England is developing within a management orientation<sup>77</sup>—as opposed to a creditor orientation—to a greater extent than was true

in the United States. To be sure, one can find recent examples of ratio listings in England which appear to be essentially the same as those found in this country,<sup>78</sup> but the British development does appear generally to be a more coherent one. It will be interesting to observe if this management oriented approach will lead to developments which are significantly different from those which took place in this country.

Ratio analysis was also being developed in various respects in some other countries. I did not evaluate the developments in these countries in detail, but the following bits of information were noted. There is interest in France in the British idea of exchanging information between firms within some systematic ratio framework, but their ratio lists do not reflect the return on investment ratio "pyramid" notion.<sup>79</sup> In India, there appears to have been ex-

<sup>70</sup> For example, see the ratio listings of the following: A. A. Fitzgerald, "Financial and Operating Ratios," *The Accountant's Journal*, (May, 1945), pp. 251-56; A. J. Cruikshank, "The Interpretation of Ratios," *The Australian Accountant*, (March, 1948), pp. 80-83; and V. L. Gole, "Financial Ratios and Credit Implications," *The Federal Accountant*, (January, 1951), pp. 7-10.

<sup>71</sup> Cruikshank, *loc. cit.*, Gole, "Financial Ratios and Credit Implications," *loc. cit.*, p. 10.

<sup>72</sup> "Accounting Ratios," *Accountancy*, (July, 1956), p. 267.

<sup>73</sup> *Ibid.*, pp. 268-69. Cf., with pp. 16-17 *supra*; This premise was not adopted in the United States despite the extensive attention given to the return on investment breakdown.

<sup>74</sup> *Ibid.*, pp. 269-71; and R. G. H. Nelson, "The Use of Ratios in Financial and Cost Accounting," *The Accountant*, (February 13, 1960), pp. 188-91.

<sup>75</sup> "Interfirm Comparison of Management Ratios" (Centre for Interfirm Comparison), pp. 1-3. Mimeographed.

<sup>76</sup> "To Diagnose Ills, Consult a 'Pyramid,'" *Business Week* November 24, 1962, pp. 128-30.

<sup>77</sup> Parkinson, *op. cit.*, pp. 12-13.

<sup>78</sup> For example, Harold C. Edey, *Introduction to Accounting* (Hutchinson University Library, 1963), pp. 142-59; and Bertram Nelson, "The Interpretation of Accounts," in W. T. Baxter and Sidney Davidson (eds.), *Studies in Accounting Theory* (Richard D. Irwin, Inc., 1962), pp. 490-97.

<sup>79</sup> Jean Nataf, "A New View of Financial Ratios," in Organization for European Economic Co-operation, European Productivity Agency, *Inter-Firm Comparisons: An Incentive to Productivity* (Project No. 379; Paris, 1957), pp. 95-101; and Maurice Renard, "Possible Solutions to Problems Raised by the Comparison of Ratios" *ibid.*, pp. 107-14.

tensive borrowing from American sources of not only types of ratios but their criteria as well.<sup>80</sup> In Japan, aggregate statistics of a large number of financial ratios are available by broad industry groupings and by size-of-firm categories.<sup>81</sup> In Russia and Red China, working capital turnover and return on investment ratios are used as control measures.<sup>82</sup> Finally, as might be expected, Canadian ratio lists are essentially the same as those in this country.<sup>83</sup>

These more recent developments in this country and abroad actually cut into the edge of the present. Thus, the point has been reached where this narrative of the development of ratio analysis must be concluded. No summary of this narrative will be offered here; instead, the end results of this development—i.e., the present state of ratio analysis—will be briefly examined.

#### THE PRESENT STATE OF RATIO ANALYSIS

From a negative viewpoint, the most striking aspect of the present state of ratio analysis is the absence of an explicit theoretical structure. Under the dominant approach of "pragmatical empiricism," the user of ratios is required to rely upon the authority of an author's experience. As a result, the subject of ratio analysis is replete with untested assertions about which ratios should be used and what their proper levels should be; and, similarly, the expected relationships of the various ratios with a quantification of some desired, or undesired, end have generally not been formulated. Studies have been conducted on the efficiency of ratios in predicting financial difficulties; but these have not been incorporated into the literature. The bulk of the ratio analysis literature consists of instructions on how to compute ratios. All of these short-comings are unfortunate because a quantitative, utilitarian activity such as ratio analysis could lend itself very well to a rigorous development.

However, there is a positive side to

ratios. A need does exist for analytical devices which will enable analysts to compare financial statements between firms and over time periods. The ratio fills that need as a simple, quick method of comparison. In addition, the available evidence suggests that ratios do have predictive value, at least in respect to financial difficulties. Thus, the ratio is certainly a very admirable device because it is simple and it has predictive value.

#### THE FUTURE ROLE OF RATIO ANALYSIS

Accordingly, it is desirable that the shortcomings of ratio analysis be remedied, insofar as possible. The future role of ratios may be an important one. Wherever there is a need for fairly simple analytical devices, ratios will be useful. Such a need will usually arise when human and non-human analytical resources are limited. This means that ratios should at least be useful to the small firm for internal analyses and to most external analysts for investment and credit evaluations. An Indian accountant even claims that ratios should be useful in the management of the economic activities of underdeveloped countries.<sup>84</sup> These areas of endeavor are certainly important enough to warrant a re-examination of ratio analysis towards making it more useful.

<sup>80</sup> R. K. Dalal, "Accountancy Ratios," *The Chartered Accountant* (India), (May, 1956), pp. 452-57; N. N. Pai, "Use of Accounting Ratios in Management Accounting," *ibid.*, Chowdhry, *Analysis of Company Financial Statements* (Asia Publishing House, 1964).

<sup>81</sup> *Economic Statistics of Japan: 1962* (Bank of Japan, Statistics Department, 1963), pp. 233-36.

<sup>82</sup> Ching-wen Kwang, "The Economic Accounting System of State Enterprise in Mainland China," *The International Journal of Accounting*, (Spring, 1966), pp. 87-95; and Barry M. Richman, *Soviet Management* (Prentice-Hall, Inc., 1965), pp. 53-76, 230-34.

<sup>83</sup> For example, C. B. Taylor, "The Industry-Wide Approach to Financial and Operating Ratios," *Cost and Management*, (May, 1956), pp. 181-89; and W. G. Leonard and Frank N. Beard, *Canadian Accounting Practice*, 2nd edition, (McGraw-Hill Company of Canada Limited, 1963), pp. 452-57.

<sup>84</sup> Pai, *loc. cit.*, p. 559.